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GB 2168938 A GB 2122068 A GB 2091078 A
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(54) Abstract Title
Cigarette filter

(57) A thermoformed filter rod having a tubular body [4] of tobacco smoke filtering material which is open at one end and closed at the other end by a filtering plug [6] of said tobacco smoke filtering material integral with the tubular body. The filter rod may be thermoformed from fibres or filamentary tow of plasticised cellulose acetate.

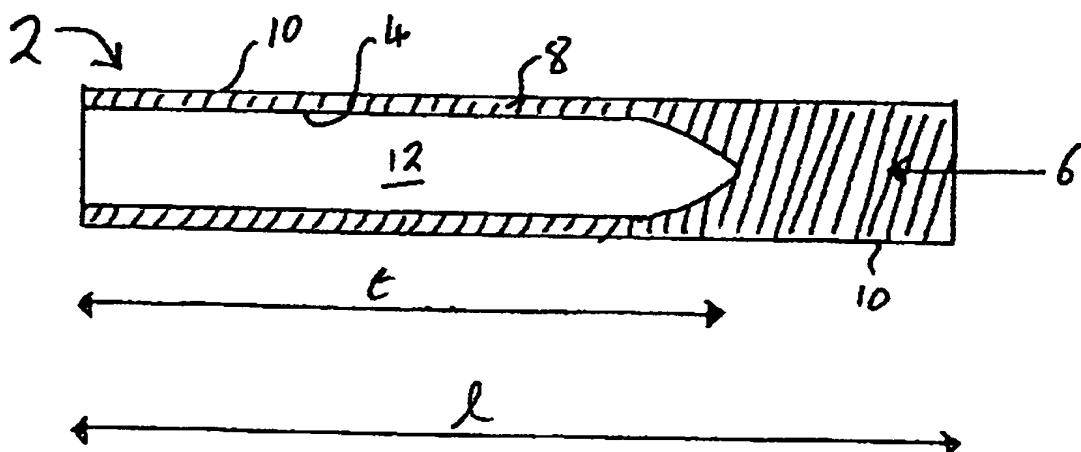
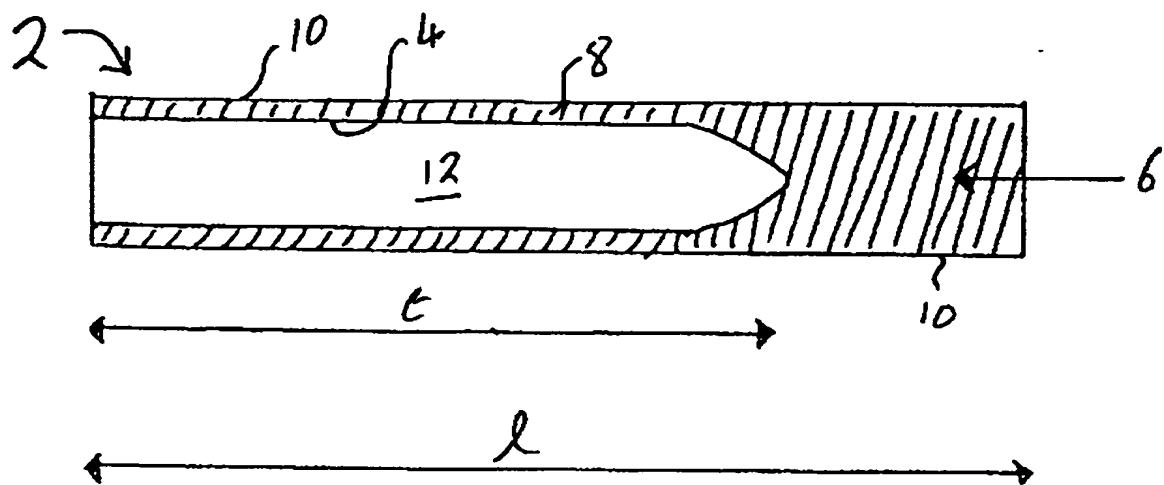
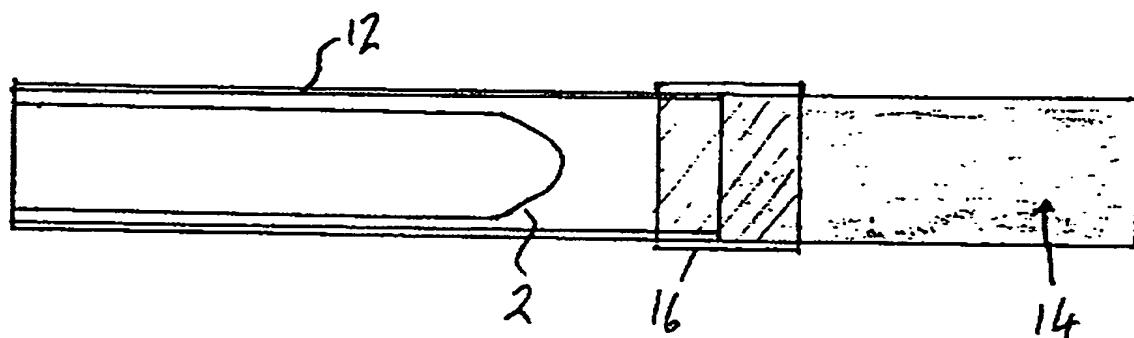
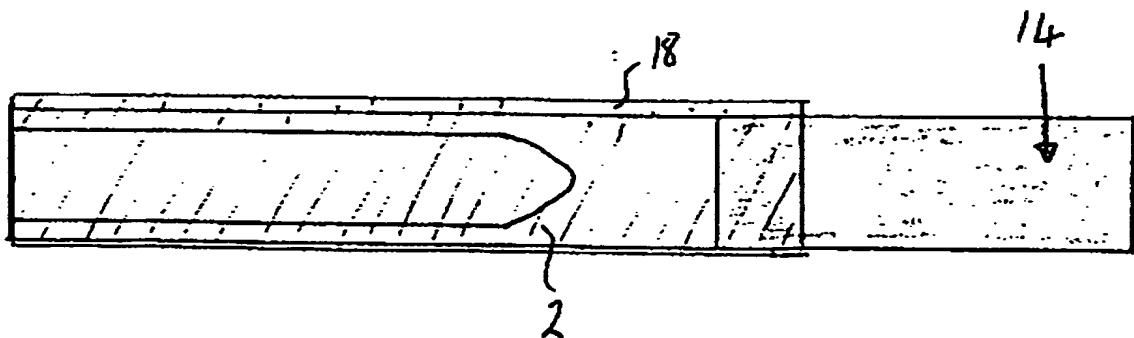


FIGURE 1

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FIGURE 1FIGURE 2FIGURE 3

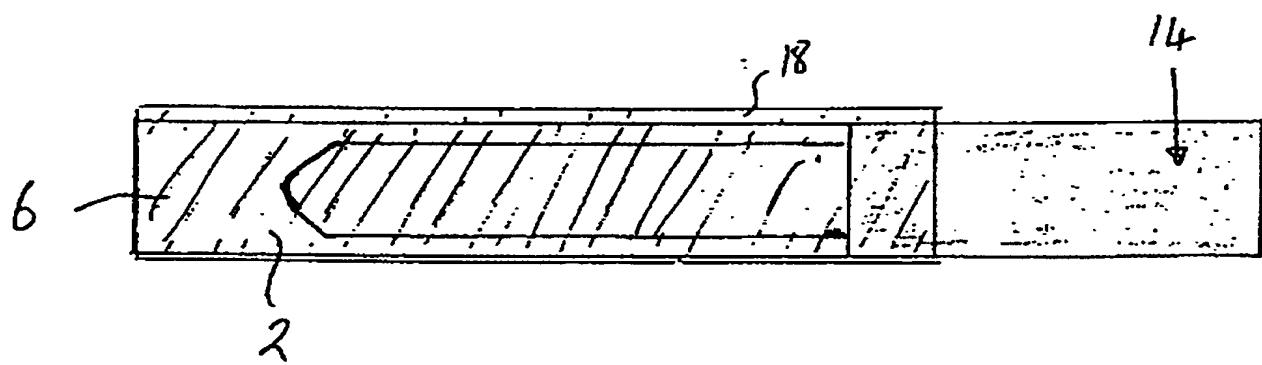


FIGURE 4

PAPIROSI CIGARETTE FILTER

The present invention concerns a filter suitable, for example, for papirosi-type cigarettes.

5 Previous attempts to incorporate a filter in a stiff wrap or in a rolled tube have been commercially unsuccessful because the assembly could not be manufactured reliably in practice.

10 The present invention solves this problem by providing a tobacco smoke filter which comprises a thermoformed filter rod having a tubular body of tobacco smoke filtering material which is open at one end and closed at the other end by a filtering plug of said tobacco smoke filtering material integral with the tubular body. The tubular body will usually be of at least the same length as the filtering 15 plug and will preferably be longer than the filtering plug - e.g. two to three or more times as long; thus the tubular body : filtering plug length ratio might be 6:1 or about 4:1 but is often suitably about 5:2, particularly in a rod of about 70 mm total length. Externally, the integral 20 thermoformed filter rod will usually be uniform in circumference and configuration from end to end; it will most usually have a uniform circular cylindrical outer surface from end to end. The bore of the tubular body may be circular in cross-section, but its cross-section might 25 instead be non-circular, for example triangular or other polygonal, cruciform, or star-shaped (with for example 4, 5 or 6 points).

30 The filter rod according to the invention may be joined to a wrapped tobacco rod with its filtering plug towards the tobacco, to form a papirosi filter cigarette with the open

end of the tubular body at its buccal end. In a different filter cigarette embodiment the filter rod is reversed, with the filtering plug at the buccal end and the open end of the tubular body towards the tobacco; with a short wrapped 5 tobacco rod (e.g. 25-50 mm) and a long filter rod according to the invention (e.g. 50 to 80 mm) having only a short filtering plug (e.g. 10 to 20 mm, or about 15 mm), such a cigarette would suit smokers wanting only a short smoke (e.g. just 3 or 4 puffs) and would be low tar (because of 10 the consumption of a low quantity of tobacco rod) whilst giving a satisfying smoke (because filtration is limited predominantly to the filtering plug section).

The filter rod is preferably thermoformed from fibres or filamentary tow of plasticised cellulose acetate, but 15 other thermoformable fibres or filaments (e.g. of polyolefin) or other thermoformable filter material, e.g. thermoformable open-cell foam, could be employed instead. Because the filter rod is thermoformed, the tubular body retains or develops firmness to resist collapse during 20 subsequent handling (e.g. wrapping and/or assembly with a cigarette rod) or on smoking.

The robust thermoformed filter rod according to the invention can be manufactured reliably at commercial speeds by a single-pass in-line procedure. Thus in one such 25 process thermoformable filter material (e.g. plasticised tow or tow mix) is fed longitudinally into and through a rod-forming garniture to which heat is supplied and into which a central mandrel reciprocates longitudinally so that there issues continuously from the garniture outlet an integral 30 thermoformed rod of tobacco smoke filtering material in which tubular body sections of the filtering material alternate longitudinally with filtering plug sections of the

filtering material. A conventional rod wrapper may be fed simultaneously into and through the garniture to provide a wrapped rod product, though the rod may be stable without such a wrapper. The continuously emerging rod, wrapped or unwrapped, can be cut laterally mid-way through the tubular body and filtering plug portions to form the individual papirosi type filter rods according to the invention. When individual rods are cut directly from the initial continuously produced rod in this way, they would normally be wrapped as part of the rod-forming process and the individual wrapped rods would normally be attached to cigarettes by ring tipping. It is possible instead for the initial continuously produced rod to be cut first into integral double or other multiple length rods which are subsequently cut further into individual rods. For example, where tipping overwrap is to be used, a double length integral rod can be abutted between and in longitudinal alignment with two wrapped tobacco rods and joined to them by a tipping overwrap extending over the double length rod and the adjacent ends of the tobacco rods, and the assembly is then cut centrally of the double length rod to give two filter cigarettes. If the double length rod has a filtering plug at each end integral with a double length tubular body therebetween, the resulting filter cigarettes will be papirosi filter cigarettes with the tubular body open at the buccal end; the double length rod could instead be cut to have a double length filtering plug between and integral with two tubular bodies open at opposite ends, in which case the resulting filter cigarettes would have the filtering plug at the buccal end and the tubular body open to the tobacco rod. Where a tipping overwrap is employed, the initial double or multiple length rods may be produced with or without their own wrapper. The integral double or multiple length rods, from which the individual rods can be

5 cut, are included within the invention; such multiple length rods comprise a plurality of the individual rods according to the invention joined integrally end-to-end in mirror image fashion, and can for example have a filtering plug exposed at each end or a tubular body open at each end.

10 The lengths of the tubular body and filtering plug can be chosen to give a papirosi-type product having a desired filtering effect. The degree of filtering will also depend on the identity and degree of compaction of the smoke filtering material, and to a small extent on the surface area of the bore of the tubular body.

15 The length of a filter rod according to the invention would typically be about 70 mm, but it can vary widely - e.g. from 20 to 90 mm. The length of the filtering plug portion would normally be from 8 or 10 to 50 mm, but as indicated above is preferably less than that of the tubular body. The filtering plug will usually not be less than 8 or 10 mm long (since otherwise its filtration effect may be too low), and it will not usually be longer than 20 or 25 or 20 30 mm (since otherwise its filtration effect or resistance to draw may be too great); particularly for a papirosi filter cigarette, the length of the tubular body is usually of less technical consequence and may be set by the overall length required of the final product, and so as indicated above may be 2 or 3 (e.g. about 2.5) times as long as the filtering plug. The wall thickness of the tubular body may for example be from 1 to 2 mm, preferably about 1.5 mm. The outer diameter of the rod is preferably between 7 and 9 mm, similar to that of conventional papirosi cigarettes.

30 The thermoformed filter rod according to the invention may be manufactured unwrapped or with its own wrapper,

longitudinally coterminous with the rod. When the filter rod has its own wrap, ring tipping may be employed to join it to a wrapped tobacco rod to form a filter cigarette; in this case the filter wrapper, exposed in the final cigarette assembly, is preferably water-resistant or water-repellant to avoid adherence to the lips during smoking. Whether the filter rod is unwrapped or provided with its own wrapper, it can instead be incorporated in the filter cigarette product by a full tipping overwrap which covers the whole length of the filter rod and the adjacent end of the wrapped tobacco rod; in this case the tipping overwrap is preferably water-repellant or water-resistant. The wrapped tobacco rod of the filter cigarette would usually be 30 or 40 mm long, but could for example be up to 90 mm long. The tobacco would be wrapped in a conventional combustible cigarette paper.

Tar delivery by the filter cigarette product can be reduced by ventilating the thermoformed filter rod through the wrapper(s) around the rod. For example where ring tipping is used, the rod wrapper may be pre-perforated to provide, during smoking, air dilution into the filter rod; similarly, where a tipping overwrap is employed this may be pre-perforated in the region to cover the rod (with the rod wrap, if any, between the overwrap and the rod being air permeable). On-line laser techniques could instead be used during assembly of the filter cigarette product to provide ventilation holes through the wrapper(s) around the thermoformed filter rod.

The tar delivery of the filter cigarette product depends on the tar yield of the tobacco element, the filtration efficiency of the filter rod and the degree (if any) of ventilation. The tar delivery might for example be from 1 to 65 mg under standard ISO conditions, but can be

controlled to under 15 mg. A papirosi filter cigarette according to the invention suffers minimal staining of the buccal end of the filter, whatever the tar delivery.

5 The filter rod and filter cigarette according to the invention are illustrated in the accompanying drawings, which are not to scale and in which :

FIGURE 1 is a schematic side sectional view of a thermoformed filter rod according to the invention;

10 **FIGURES 2 and 3** are similar views of the Figure 1 filter rod incorporated in papirosi filter cigarettes by ring tipping and a tipping overwrap respectively; and

FIGURE 4 is a similar view of the Figure 1 filter rod incorporated in a filter cigarette with its filtering plug at the buccal end.

15 The thermoformed filter rod [2] shown in Figure 1 has a tubular body [4] of filtering material integral with a filtering plug [6] of said filtering material. The integral thermoformed rod [2] is of plasticised cellulose acetate filamentary tow. The overall length l of the rod is typically about 70 mm, with the length t of the tubular body [4] being for example about 50 mm. The wall [8] of the tubular body [4] is about 1.5 mm thick and the outer surface [10] of the rod is of constant circular section throughout its length, with a diameter of about 8 mm. The bore [12] of 20 the tubular body is also of circular section.
25

Figure 2 shows the Figure 1 rod, having a rod wrap [12] longitudinally coterminous therewith, joined to a wrapped tobacco rod [14] by means of ring tipping [16]. Figure 3

shows the Figure 1 rod, without wrapper [12], joined to wrapped tobacco rod [14] by a tipping overwrap [18]. In Figures 2 and 3, the tobacco rod [14] is about 40 mm. long.

5 In Figure 4 the thermoformed filter rod [2] is in the opposite orientation to that in Figure 3, being joined by tipping overwrap [18] to wrapped tobacco rod [14] with the open end of its tubular body against the tobacco and its filtering plug at the buccal end. The dimensions are as indicated for Figures 1 to 3.

10 In Figures 2 to 4 the wrappers [12 and 18] are air impermeable, but in each case they could instead be ventilating wraps.

EXAMPLES

15 Physical details of various individual thermoformed filter rods and filter cigarettes according to the invention are set out in the Table below.

20 In all Examples the integral filter rod length of 70 mm is made up of substantially 50 mm of tubular body and substantially 20 mm of filtering plug.

25 Examples A, B and C were made using a 50/50 mix of 5Y40 and 7Y34 cellulose acetate tows, whilst Examples T and L were made wholly of 7Y34 cellulose acetate tow; a "xYn" tow is one of $n \times 10^3$ total tow denier made up of Y-shaped cross-section filaments each of individual filament denier x. The plasticised tow or tow mix and air-impermeable wrapper therefor are fed longitudinally into and through a heated rod-forming garniture with reciprocating mandrel as described above to give a wrapped integral rod of 30 thermoformed tow in which 100 mm long tubular sections of

the tow alternate with 40 mm long filtering plugs of the tow; the cross-sectional shape of the bore of the tubular body is dictated by the cross-sectional shape of the mandrel. The continuously produced wrapped rod is cut laterally mid-way through the tubular body and filtering plug portions to form the individual papirosi type filter rods according to the invention. The hardness measurements were made on the filtering plug portion of the filter rod; the wall of the tubular body portion has a slightly higher hardness than the filtering plug.

For Examples L and T, each wrapped rod was attached to a standard wrapped tobacco rod by ring tipping with filtering plug against the tobacco and tubular body open at the buccal end, to give a papirosi filter cigarette. The tar and nicotine retention were measured under standard conditions; in each case tar delivery was reduced to about 13 mg. The values quoted, other than for retention, are those of the unattached filter rods.

| EXAMPLE | LENGTH (mm) | CIRCUMFERENCE (mm) | PRESSURE DROP (mm water) | HARDNESS | WEIGHT (g) | TUBE SHAPE |
|---------|----------------|-----------------------|-----------------------------|----------|---------------|------------|
| A | 70 | 24.10 | 174.9 | 95.9 | 0.913 | Round |
| B | 70 | 24.09 | 145.3 | 96.2 | 0.954 | Star |
| C | 70 | 24.21 | 181.9 | 95.7 | 0.937 | Star |

| EXAMPLE | LENGTH (mm) | CIRCUMFERENCE (mm) | PRESSURE DROP (mm water) | WEIGHT (g) | PLASTICISER LEVEL (%) | TAR RETENTION (%) | NICOTINE RETENTION (%) |
|---------|----------------|-----------------------|--------------------------------|---------------|-----------------------------|-------------------------|------------------------------|
| T | 70 | 24.16 | 86.4 | 0.824 | 16.5 | 42.2 | 39.1 |
| L | 70 | 24.20 | 87.4 | 0.845 | 16.5 | 42.5 | 42.0 |

C L A I M S :

1. A thermoformed filter rod having a tubular body of tobacco smoke filtering material which is open at one end and closed at the other end by a filtering plug of said tobacco smoke filtering material integral with the tubular body.
5
2. A filter rod according to claim 1 wherein the tubular body is longer than the filtering plug.
3. A filter rod according to claim 1 or 2 thermoformed from fibres or filamentary tow of plasticised cellulose acetate.
10
4. A filter rod according to any preceding claim surrounded by an optionally ventilating rod wrap longitudinally coterminous with the rod.
- 15 5. A filter cigarette comprising a wrapped tobacco rod joined to a filter according to any preceding claim.
6. A filter cigarette according to claim 5 wherein the filter rod is according to claim 4 and the filter rod and cigarette rod are joined by ring tipping.
- 20 7. A filter cigarette according to claim 5 wherein the filter rod and cigarette rod are joined by a tipping overwrap.
8. A filter cigarette according to claim 7 having ventilation holes through the wrapper(s) around the filter rod.
25

9. A papirosi filter cigarette according to any of claims 5 to 8 wherein said open end of the tubular body is open at the buccal end of the filter cigarette.
10. A filter cigarette according to any of claims 5 to 8 wherein the filtering plug is at the buccal end of the filter cigarette.
11. An integral multiple length rod from which a rod according to any of claims 1 to 4 can be cut.
12. A multiple length rod according to claim 11 having a filtering plug exposed at each end.
13. A multiple length rod according to claim 11 having a tubular body open at each end.



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Claims searched: 1-13

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Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.Q): A2C CEGE,CEH,CEJ

Int Cl (Ed.6): A24D 3/04

Other: On-Line W.P.I.

Documents considered to be relevant:

| Category | Identity of document and relevant passage | | Relevant to claims |
|----------|---|---|--------------------|
| X, Y | GB 2166938 | Brown & Williamson Tobacco Corporation (See Figs 2&4) | 1-3,5,9 |
| X, Y | GB 2122066 | Brown & Williamson Tobacco Corporation (See Figs 1 & 2) | 1-8 & 10 |
| X, Y | GB 2091078 | Filtrona Limited | 1-6, 8, 10 & 11 |
| X, Y | GB 1527705 | Liggett & Myers Incorporated | 1,3-5,8,10 |
| Y | GB 1169932 | Cigarette Components Limited | |
| X, Y | US 3621851 | Kata Manufacturing & Filtering Co.(See Figs 1-8) | 1-5 & 9 |

| | | | |
|---|---|---|--|
| X | Document indicating lack of novelty or inventive step | A | Document indicating technological background and/or state of the art. |
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